

POZZOLANA MORTAR AND PINE TIMBER

THE following letter has been sent us for publication by Prof. Tyndall:—

Villa Guastalla, Via Palestro, Rome, April 14

SIR,—A very curious and unexpected circumstance has occurred in Rome, which, as it depends on chemical action, may have some interest for you.

Prior to 1870, when Rome became an integral part of the kingdom of Italy, the beams used in the construction of houses were of chestnut wood. After that date a vast amount of building was undertaken and now a whole quarter of the city stands on ground formerly occupied by vineyards and gardens.

In lieu of chestnut, pine was largely used, having been brought *viâ* Venice from the Dolomite Alps. The latter was preferable, as being procurable of larger scantling, of greater length and at a less cost.

After a few years, the roofs and floors in which the pine had been used were found to be failing. A beam used in a flat roof or in flooring, where it was imbedded in a wall was found to be rotten; while the body of the beam was perfectly sound. A very considerable sum of money was thus lost, as many of the roofs and floors of the new houses on the Esquiline had to be renewed.

But what was the cause of this sudden perishing of the ends of the pine beams, such as had been known to last centuries in Venice? The answer to this question remained a puzzle for a long time; until on taking down the scaffolding of the Ministry of Finance lately completed, a complete answer was found.

One of its scaffold poles had been imbedded for, say, four feet in the ground; about its foot was a heap of the *débris* of Pozzolana mortar, say, six feet high. That part which had been underground was perfectly sound; that which had been surrounded by mortar was utterly rotten; and finally, the remainder of the pole above the ground was perfectly sound. Hence, it was clear that the mortar was to blame. But in what respect did this mortar differ from that used at Venice in which pine wood beams lay embedded for centuries with impunity? The sole difference was in the use of pozzolana—a volcanic earth—instead of sand, and as this substance had been used for mortar in Rome and Naples for ages in contact with chestnut beams with impunity, the only logical conclusion is that pozzolana and pine wood have some chemical affinity which causes some of their ingredients to combine, to the destruction of the latter.

Inclosed are a few grains of pozzolana, such as is used for mortar in Rome.

Yours faithfully,

HENRY H. MAXWELL, Lieut.-General R.A.

Dr. Tyndall

STANFORD'S STEREOGRAPHICAL MAP OF THE BRITISH ISLES

MR. STANFORD has recently issued a map which marks a distinct advance in British cartography, and one which gives us ground for hoping that some day we may be able to equal in this country the work of the geographical establishments of Germany. The map in question represents, in the first place, the United Kingdom, with its hills and mountains standing solidly out from the ground, as if a perfect relief model of the country lit up from the North had been photographed. The plains and valleys are also clearly shown; on ordinary maps these cannot be distinguished, and yet they are as important features as the hills themselves.

Great care has been taken to embody all the usual information without in any way detracting from the beauty of the map. Thus the railways are shown, and cities and towns, so as not to interfere with the physical

features, as well as the hills and plains, vales and rivers, are named in a clear yet delicate type.

As an example of the information conveyed, we can mark in the map how the ground rises gradually in going west from London all the way to the summit ridge of the Chiltern Hills, and then falls suddenly to the Vale of Aylesbury and the Vale of the White Horse; the ground again rising gradually to the summit of the Cotswold Hills, and then falling suddenly to the valley of the Severn; how the headwaters of the Thames all lie on the top of the second ridge, while the first ridge is the boundary between the Upper and Lower Thames Valley, presenting only one vulnerable point, between Walsingham and Reading, through which the river can make its way.

Mr. Stanford claims that the map is at the same time artistic and scientifically accurate; and from the examination we have made we believe both claims can be well made out.

OUR ASTRONOMICAL COLUMN

TRANSITS OF MERCURY.—After the transit of Mercury across the sun's disc on Monday next, May 6, which will be visible in this country through about half its duration, there remains only one transit of this planet at the descending node in the present century; it will take place on May 10, 1891, with the following elements according to Leverrier's tables of sun and planet:—

G.M.T. of conjunction in R.A. 1891, May 9, at 15h. 55m. 40s.

R.A.	46° 44' 14".1
Sun's hourly motion in R.A.	2 26.2
Planet's " " " " " " " " " "	— 1 18.7
Sun's declination	+17 32 1.9
Planet's " " " " " " " " " "	+17 18 0.4
Sun's hourly motion in decl.	+ 0 39.6
Planet's " " " " " " " " " "	— 1 6.7
Sun's horizontal parallax	8.76
Planet's " " " " " " " " " "	15.92
Sun's semi-diameter	15 50.33
Planet's " " " " " " " " " "	6.01

Whence the first external geocentric contact occurs at 11h. 53m. 19s. at 65° from the sun's north point towards the west, for the inverted image, and the last external contact at 16h. 52m. 18s. at 12° from the north point towards the east. At Greenwich the external contact at ingress takes place at 4h. 50m. 26s. A.M. on May 10, and the sun's centre is in the horizon at 4h. 18.5m., so that Mercury will be only half an hour upon his disc, after observation is possible here. And while the egress of the planet from the solar disc is alone visible in these islands in the transit of 1891, in that of November 10, 1894, at the opposite node—the last phenomenon of the kind in the nineteenth century—the ingress only can be witnessed here, under favourable atmospheric circumstances, not to be insured at this season; the first external contact at Greenwich taking place at 3h. 55m. P.M. and the sun setting at 4h. 18m.

At the sitting of the Paris Academy of Sciences on April 22, a letter from M. André was read, stating that the expedition sent by the Academy and the French Minister of Public Instruction, to Ogden in the Utah territory for the Observation of the Transit of Mercury in the present month, had arrived safely at its destination. After experiencing very liberal treatment from the French Trans-Atlantic Company, the instruments were admitted without payment of duty at New York, and the observers received free passes on the lines of railway converging in Utah, both for the outward and homeward journeys. The Government of Washington placed at their disposal the nearly-finished observatory at Ogden, at the same time undertaking to provide gratuitously all necessary appliances for the observations. A telegraphic wire from Washington to Utah was available

for determination of time, and the authorities of the U. S. Naval Observatory confided to the expedition the photographic instruments which had been employed by the American parties on the occasion of the late Transit of Venus, for comparison with those brought from France. M. Sainte-Claire Deville in communicating these particulars to the Paris Academy, adds—"Il suffit de publier tous ces détails pour que la gratitude de tous les savants soit acquise à de pareils actes de confraternité scientifique."

KEPLER'S MANUSCRIPTS AND RELICS.—In the last Annual Report of the Director of the Imperial Observatory at Pulkowa, M. Otto Struve, to the Visiting Committee, attention is called to an interesting acquisition recently made by this great astronomical establishment. It is known that the library possesses, in addition to all the notable published works of Kepler, the nearly complete collection of his manuscripts. This circumstance caused Prof. Galle, of the Observatory at Breslau, to inform M. Struve that certain articles of which the last direct descendants of Kepler, resident in Silesia, were in possession, and which had been religiously preserved in the family as memorials of their immortal ancestor, might be obtained by purchase, and the result has been that they are now deposited at Pulkowa, to be preserved with other astronomical treasures, which the Struves, father and son, have secured for the institution. Amongst these articles are particularly mentioned two miniature portraits on copper of Kepler and his first wife, at the time of their marriage, and a memorandum-book used by his first wife and continued by his eldest daughter.

THE PULKOWA LIBRARY CATALOGUE.—In the same Report from the Director of the Russian Observatory, it is mentioned that a continuation of the Catalogue of the valuable library has been some time in preparation, the numerous additions, upwards of 10,000, which have been made to it since the publication of the first Catalogue in 1860, rendering a more complete work very desirable. M. Otto Struve justly remarks that the Catalogue of 1860 has had its uses beyond the pale of the establishment, and we feel sure that workers in almost every branch of astronomy will bear witness to the assistance they have received from that excellent and well-arranged analysis of the contents of this important library, whereby they will have been guided with comparative facility to a knowledge of the literature special to particular astronomical subjects upon which they have been engaged.

GEOGRAPHICAL NOTES

ROUND THE WORLD.—The French Société des Voyages Autour du Monde, have obtained the steamer *Picardie*, of the company Valéry frère et fils, of Marseilles, in which to make their intended voyage round the world. The vessel is 1,560 tons and 1,000 horsepower, and is fitted up in the best manner. She is announced to leave Marseilles on June 30 under the command of Lieut. M. G. Biard. The staff is complete, and it is stated that the passenger list will shortly be closed. This project seems likely to have a better result than the much-talked-of American Woodruff Continental Voyage Round the World, which from the first seems to have been utterly hollow, and collapsed on being probed.

AFRICA.—In his recent journey in East Central Africa, the late Capt. Elton, H.M.'s Consul at Mozambique, paid considerable attention to the northern end of Lake Nyassa, which was previously very imperfectly known. He arrived, we believe, at a very positive conclusion that no river flowed out of the lake, but he discovered an important and navigable affluent, the Rombashi River. This he considered to be well suited for the late end of

the caravan road from the coast. This road, which is being constructed by private enterprise and under the supervision of English engineers, starts from Dar-es-Salam, some twenty miles to the south of Zanzibar, and thirty or forty miles of it have already been completed. When finished it will, no doubt, have an important bearing on the future of this part of Africa, and it will open up to commerce and civilisation a region a considerable portion of which has remained hitherto entirely unexplored.

The Abbé Debaize, who recently received a subvention of 100,000 francs from the French Government for purposes of African exploration, left Marseilles on April 20 for Zanzibar, where he will arrive at the end of May. He will remain there for some time in order to make the most complete preparations for his journey across the Continent, which is expected to occupy three years. The same steamer carried nine French missionaries despatched to establish posts at the Victoria Nyanza and Lake Tanganyika.

NOTES

PROF. HUGHES, the well-known inventor of the type-printing apparatus so largely employed on the Continent, has made the wonderful discovery that some bodies are sensitive to sound as selenium is sensitive to light. If such a body be placed in the circuit of a small battery it will be so affected by the sonorous vibrations when spoken to as to replace entirely the transmitter of a Bell telephone. Conversation, music, and all the sounds transmitted by an ordinary telephone are easily reproduced. A mere scratch with the finger-nail, or a touch with the soft part of a feather is distinctly transmitted. The sonorous vibrations produce strains in the conductor, which cause variations in the resistance of the circuit, and thereby produce similar variations in a current flowing through that conductor.

THE French deserve all the praise that has been recently lavished upon them for the energy and determination and sound judgment with which they have quietly carried on the preparations that culminated in the imposing ceremony of yesterday. Their new Exhibition is the one bright spot in the European horizon at present. Even till very recently many doubted whether these preparations would ever come to anything, partly on account of the disturbed state of Europe, and partly because the earnestness and perseverance of the French as a people were doubted. We have had frequent occasion recently to bring before our readers evidences of the renewed energy of the French in respect of scientific research; and the unprecedentedly magnificent display which now divides the attention of the world with the Eastern crisis, is only one of many other proofs that the French are rapidly achieving for themselves a position more solid than ever they held before. The world, then, is once more taking stock of her industrial riches, and ever since the Exhibitions of Vienna and Philadelphia, the discoveries and applications of science have been so many and so rapid that the Paris Exhibition must present many new features. For, indeed, however much the great mass of visitors may ignore it, the multitudinous display that was opened yesterday, is simply a specimen of the gifts of science to humanity, as the French themselves would say. Judging from the catalogues British trade is well represented, and our principal scientific-instrument makers are well to the front; but British culture and British science are nowhere, and, as we have said already, the British Commissioners have lost a splendid opportunity, and will have simply nothing to show beside the magnificent educational and scientific collections of France herself. We have already spoken at length of the many preparations made for representation of French science—scientific conferences, the scientific lectures, scientific excursions, besides the great display of